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A NEW TURTLE FROM THE KANSAS CRETACEOUS.

BY S. W. WILLISTON, UNIVERSITY OF KANSAS, LAWRENCE.

Read before the Academy, December 28, 1900.

Porthochelys laticeps, gen. et sp. nov.

SKULL. The palatal surface of the maxillæ is very shallowly concave, and somewhat inclined inward; it is very broad, especially posteriorly. The alveolar or cutting edge is remarkably deep, especially posteriorly, decreasing to a little more than half the width at the front part. This whole structure is in striking contrast to the same parts in *Toxochelys*, where the vertical portion decreases in width posteriorly. On the posterior third the inner margin of the palatal surface is roughened, where it joins, for most of the distance, the pterygoid processes. This roughened line is continued on the palatines to their junction with the vomer. At the base of the vertical portion, which stands nearly at right angles to the other surface, there are some small, nutrient foramina anteriorly. The external surface of the bone is very broad, strongly convex near the lower margin, and much broadened posteriorly.

The premaxillaries in front are deeper than wide, strongly convex from above downward, and receding below to the sharp alveolar border. In the nasal opening the margin is rounded and deeply concave in each bone, the two forming a pointed, median tubercle. The sutures with the maxillæ are parallel throughout. On the buccal surface the vertical and palatal parts are nearly at right angles to each other, the latter a little the broader. Posteriorly their union with the vomer forms a concave line, just back of which there are some small palatine foramina. There is but slight indication of the fossa that is well marked in *Toxochelys latiremis.*

The prefrontals are thick and strong, the two together nearly square in outline or a little broader than long. In the nares the two project into a rounded, obtuse angle. They form the upper margin only of the nares, the maxillary suture evidently running from near the angle of the orbit to the angle of the nares. Posteriorly they unite with the frontals by a straight transverse suture before the middle of the orbit.

The frontals are deeply marked with grooves, as are the prefrontals. Their orbital margins are thin and nearly evenly concave in outline, extending outward about one-third of the width of the orbit. About five millimeters back of the orbits they join the parietals in a nearly straight transverse suture. Below, the two bones are strongly thickened in the middle to include the rhinencephalic groove.

The parietals are incomplete posteriorly in the described specimen. They have the same rugose markings as the two preceding bones, and are strongly arched. The parieto-postfrontal suture joins the angle of the parieto-frontal and fronto-postfrontal sutures, and is directed obliquely outwards and backwards.

The postfrontals, or postorbito-frontals, connect the frontal internally with the jugals externally, and form the thin posterior margin of the orbits, as in *Toxochelys.* The union of the jugal is much the same as in *Toxochelys.* The suture in the outer part of the orbital fossa runs straight forward nearly parallel with the palatine suture and with the median line of the skull to the orbital margin, and then turns backward irregularly on the outer surface. The union is strong and massive. The bone is broad and convex externally. Posteriorly, it joins the quadrato-jugal in an oblique suture. The lower border is thin and concave.

The vomer is stout, broad and concave anteriorly; laterally, the anterior expanded portion joins the maxillæ in a rugose suture, expanding backward to join the anterior end of the palatines, as in *Toxochelys*, excluding the maxillæ from the narial border. At the beginning of the narial opening the bone rapidly narrows to less than half of its greatest width, and gently widens to its union with the pterygoids. Between the nares the bone forms a stout, narrow ridge, which becomes nearly obsolete at its junction with the pterygoids.

The palatines are broadly connected with the maxillæ. From the rugose ridge already mentioned, continuing the border of the maxilla forward, the bone turns upward, and is thinner, forming the shallow concave groove of the nares. They join the vomer broadly in a nearly straight suture, and posteriorly the pterygoids on the outer part of the transverse suture.

The pterygoids have the median suture nearly obliterated. They are grooved shallowly in the middle. Laterally they send out a broad, ectopterygoid process, for union with the maxillæ and jugals. Near the middle posteriorly there is a vertical flattened surface to abut against the mandibles. The large, oval, palatine foramen is enclosed nearly wholly between these two bones, the free maxillary border showing only for two or three millimeters. Posteriorly the pterygoids join the quadrates by a flattened process; in the middle by a V-shaped suture, the basisphenoid. Near the end of the arms of the V there is a small foramen on each side.

The basisphenoid shows a small, triangular, nearly smooth surface between the pterygoids and basioccipital.

The basioccipital surface forms a shallow fossa. The occipital condyle is bipartite.

The external nares are much broader than high; their sides, formed by the maxillæ, are nearly parallel; the lower border, formed by the premaxillaries, is biconcave, with a median tubercle; the upper border, formed by the prefrontals, has a strong convexity from near the rounded angles; on the floor a narrow, well-marked groove runs from each palatine foramen forward nearly to the free margin.

The orbits are obliquely ovate in outline and look obliquely upward, outward, and forward. On the anterior part below, the opening of the nares is marked by a sharp ridge in the palatines; under the posterior part is seen the larger part of the palatine foramina.

The mandibles are remarkable for their stoutness and breadth. The alveolar surface is shallowly concave, longitudinally and transversely, and narrow at the symphysis, which is marked by a prominent rugose ridge. Posteriorly the surface rises very high into the coronary process, beyond which the specimen described is for the most part wanting. Below, the part described forms a broad, gently convex surface, marked by numerous small foramina. Internally there is a well-marked groove below the thinned inner border of the alveolar surface. In the middle, in front, the surface forms a rather broad, trough-like concavity. The symphysis is elongate.

As a whole, the skull is remarkable for its broad, strongly convex form, its extremely deep alveolar margin of the maxillæ, its rostral protuberance, and the broad, flattened and strong maxillæ, together with the strong venous markings of its surface. While the posterior part of the described skull is injured, it was undoubtedly roofed over, as in *Toxochelys*. While the general relations of the bones are nearly as in *Toxochelys*, the proportions and forms of the different parts are very different, all indicating distinctly different habits.

CARAPACE. About three-fifths of the carapace is preserved. In the drawing

Fig. 1.

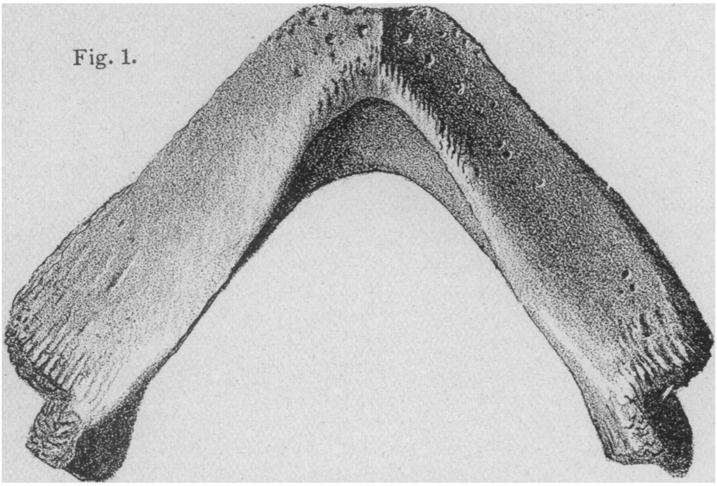
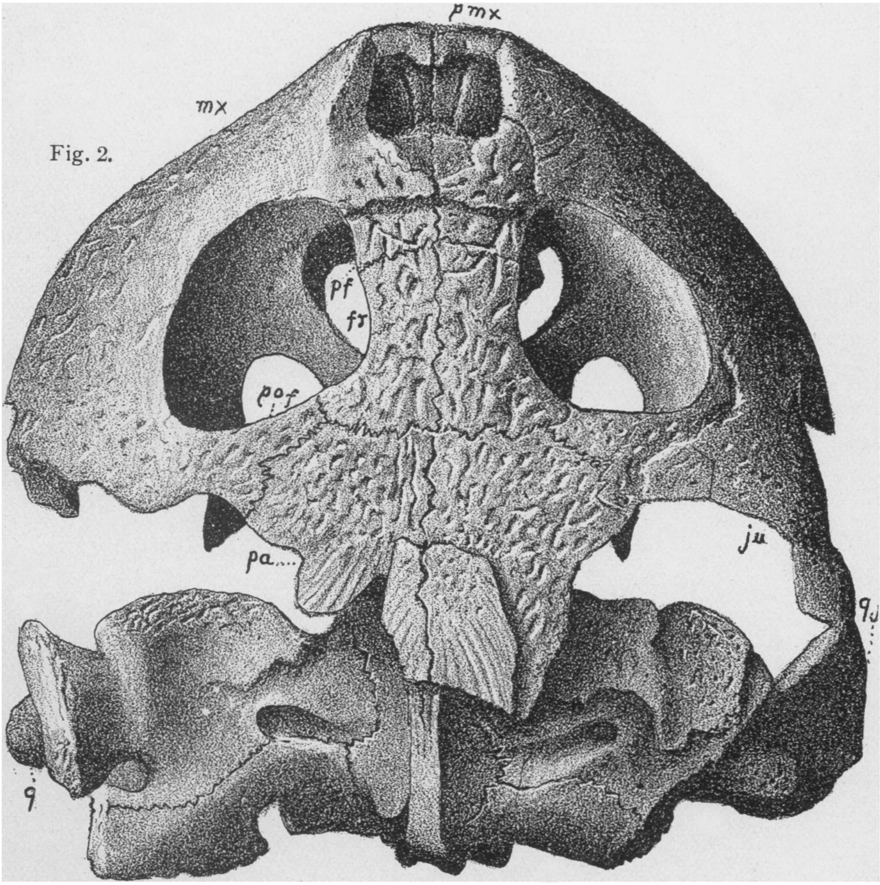


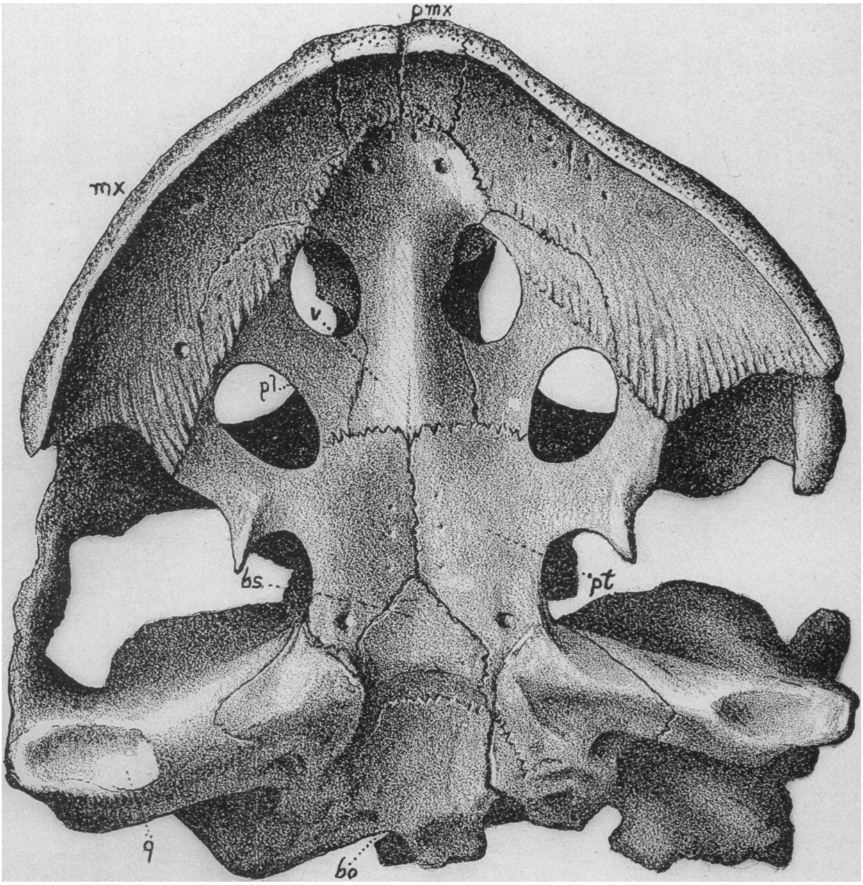
Fig. 2.



PORTHOCHELYS LATICEPS WILL.

NATURAL SIZE.

Fig. 1. Dentary. Fig. 2. Cranium.



PORTHOCHELYS LATICEPS WILL.

NATURAL SIZE.

the middle portion of the right side has been restored from the left. In shape the carapace is broad and but little pointed posteriorly. As preserved it is but slightly convex, though doubtless more so in life. The surface is smooth, except where marked by the shield grooves. It differs from other American Cretaceous turtles of allied structure in the almost complete ossification. Except in the first pleural, there is between each and the peripheral a small, rounded or oval vacuity, with smooth, rounded, thickened margins. The margins, however, are so closely pressed down upon the peripherals that their precise nature is not easily made out.

The neurals are narrow throughout; they are smooth, without protuberance or elevation, and they show no trace for attachment to the vertebræ below. The second, third, and fourth, all that are preserved anteriorly, articulate on the anterior lateral margin angularly with the preceding pleurals, behind which the lateral borders are nearly straight and parallel. The last neural and a part of the one preceding it are preserved; they are narrower than the anterior ones. There are two post neurals; the first is large and triangular in shape, with the anterior apex truncated for the eighth neural. The second is of about the same size as the first, and in the shape of a regular trapezium, articulating broadly behind with the pygal.

The pleurals are of the usual number—eight. The first is relatively small, joining in its full length the first and second peripherals, and by its apex the third; the second pleural is, perhaps, the broadest of all, and joins the third, the whole of the fourth, and a small part of the fifth peripherals; the third pleural, nearly as broad, joins the most of the fifth and a small portion of the sixth peripherals; the fourth pleural, also broad, joins the most of the sixth and more than half of seventh; the fifth pleural, the narrowest, especially proximally, joins a part of the seventh and more than half of the eighth peripherals; the sixth pleural, a little broader than the fifth, joins for about an equal extent the eighth and ninth peripherals; the seventh pleural has the larger part of its distal border joined to the ninth peripheral and a lesser portion to the tenth; the eighth pleural articulates almost exclusively with the tenth, just touching the eleventh.

The peripherals, of the usual number, are narrow anteriorly, broad and massive posteriorly. On the posterior part, near the middle of each bone, where the shield suture reaches the thin margin, there is a marked angulation, with the intervening borders concave; these angularities are slight or none at all anteriorly. The nuchal bone is, unfortunately, largely missing, so that it is now impossible to say whether or not there was an articulation with the cervical vertebræ so characteristic of the sea turtles. The pygal is small; its borders are thin and placed at an obtuse angle with each other, and with a semicircular notch in the middle, where they meet.

The shields are well indicated by grooves, and are of the usual number and arrangement, as in *Chelone* or *Chelydra*. The vertebrals are relatively small. The cervical and caudal are of considerable size. The first lateral is relatively small. There are four laterals. The pygal shield is double, making twenty-five as the entire number.

Of the plastron, the hyoplastron and xiphiplastron are complete or nearly so; the hypoplastron lacks the outer part on both sides; and of the epiplastron, only a small part, suturally united to the hyoplastron, is preserved. In the drawing, the elements of the two sides are separated as far as the carapace would permit. In all probability, if not certainty, however, the bones of the two sides interlock in the middle, leaving only a median fontanel, of moderate size, and a slender one between the xiphiplastra.

The union between the hyo- and hypoplastra is long and stout, the bones here being ten or twelve millimeters in thickness and the suture a close one. The other margins are thinned, and the denticulations are not long. The suture of the elongate and thin xiphiplastra with the hypoplastra is oblique and irregular, but firm. Of the other elements of the skeleton not many are preserved. A single biconcave cervical vertebra and a concavo-convex centrum, in their crushed condition, present no distinguishable differences from the neck vertebræ of *Toxochelys.*

A proximal portion of the scapula and a claw likewise offer no tangible differences from the same bones of *Toxochelys.*

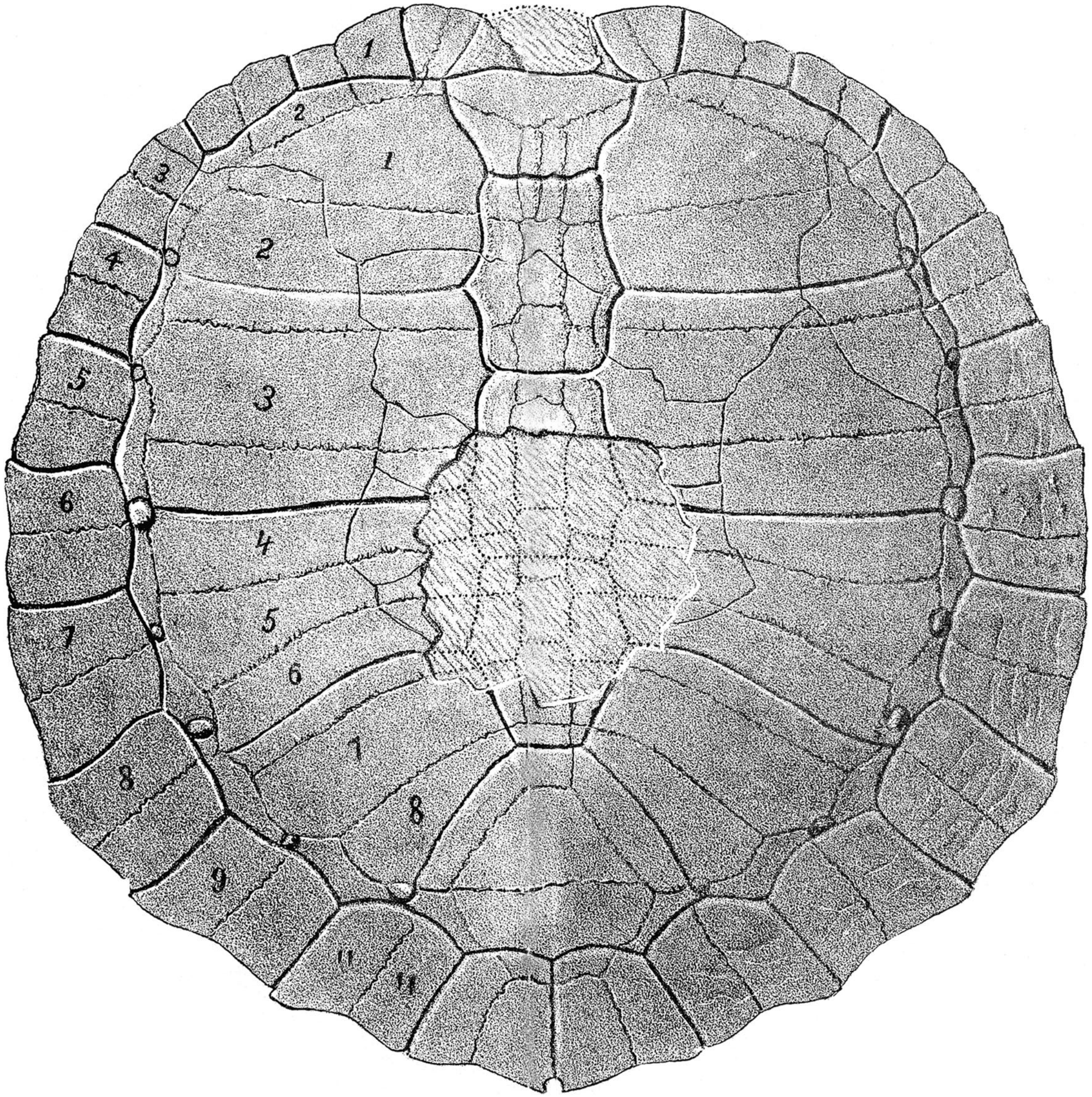
The humerus preserved unfortunately lacks most of its ulnar process. The articulating surface is in the shape of a large oval directed toward the dorsal side. The radial process is stout and prominent, directed ventrally, with a deep depression on its inner side and rugose markings on its external surface. The shaft is considerably constricted below the expanded part and moderately dilated distally, and is strongly curved. There is a well-marked ectepicondylar groove near the external border distally. The bone is flattened throughout, doubtlessly largely of post-mortem origin.

The distal part of an arm or leg bone, probably the radius, is present. It is much flattened and curved; the articular border transverse.

The relationships of *Porthochelys* are clearly with *Toxochelys latiremis*, which certainly should be included in the same family. Of *T. latiremis* almost nothing is known concerning the carapace and plastron. I suspect that when the carapace of this form is found it may have a fully coossified carapace, as in *Porthochelys.* From *Toxochelys serrifer*, of which the carapace is pretty well known, the differences are obvious in the incomplete ossification, the serration of the neurals, the shape of the pygal, etc. This species is the most common of the testudinates of the Kansas Cretaceous; and I believe that when the type of the genus *Toxochelys* is better known *T. serrifer* will be relegated to another genus. The generic differences from *Toxochelys* must then, for the present, be based upon cranial characters—these, I believe, are amply sufficient—in the structure of the mandible, the maxilla and the strong alveolar border, the shape of the prefrontals, frontals, jugals, etc.

From other Cretaceous turtles, certainly the American ones, differences are obvious. From *Osteopygis*, *Lytoloma* (*Euclastes*), *Peritresius*, *Catapleura*, *Plastomenus*, the ossification of the carapace, smoothness of the bones, shape of the skull, etc., will distinguish. The skull shows considerable resemblance in shape to that of *Bothremys*, but differs materially in the structure of the maxillæ.

In what family of turtles this genus, as well as *Toxochelys*, should be placed is yet a matter of uncertainty. Hay and Case are both inclined to locate *Toxochelys* with the Cheloniidæ. In the present genus, the ossification of the carapace, the more complete ossification of the plastron, the presence of large palatine foramina, the anterior location of the internal nares and the structure of the humerus are differences from the sea turtles that should not be overlooked. It is true that in old individuals of the sea turtles, especially of *Thalassochelys*, the carapace may become ossified throughout. Nevertheless, the high degree of ossification of both the carapace and plastron in this form indicates a less high degree of specialization to aquatic conditions, and a greater resemblance to *Chelydra* and its allied forms. I believe that when the limbs of individuals of this genus, as also of *Toxochelys*, are better known, they will present less of the flipper-like structure than is now believed to be the case.



PORTHOCHELYS LATICEPS WILL.

Two-ninths natural size.

Certainly the large size of the radial process, its position on the ventral side of the bone, the strong curvature of the shaft of the bone, and its less expansion distally, are all characters inconsistent with the Cheloniidæ. (See Wieland, Am. Jour. Sci., 9: 413, 1900.)

The remarkably complete specimen upon which this genus and species are based was collected by Mr. E. H. Sellards, of the paleontological department of the university, on the Saline river, in Trego county, the past summer. I wish also to express my thanks to Prof. J. T. Shearer, of Wa Keeney, for kind assistance in the collection of the specimen.

For the sake of comparison, I give a figure, natural size, of the upper view of *Toxochelys latiremis*, made from an unusually well-preserved specimen in the university museum, collected by Mr. H. T. Martin, in Logan county, Kansas.

EXPLANATION OF PLATES.

The following explanation applies to the first three plates: *pmx*, premaxillary; *mx*, maxillary; *pf*, prefrontal; *fr*, frontal; *pof*, postorbito-frontal; *pa*, parietal; *j* or *ju*, jugal; *q*, quadrate: *v*, vomer; *pl*, palatine; *pt*, pterygoid; *bs*, basisphenoid; *bo*, basioccipital; *qj*, quadratojugal.

Plate XVIII. *Toxochelys latiremis* Cope, natural size.
" XIX. *Porthochelys laticeps* Will., natural size. Fig. 1, dentary; fig. 2, cranium.
" XX. *Porthochelys laticeps* Will., natural size.
" XIX. *Porthochelys laticeps* Will., upper view of carapace, two-ninths natural size.
" XXII. *Porthochelys laticeps* Will. Fig. 1, ventral view of right humerus, three-fourths natural size; fig. 2, plastron, two-ninths natural size: *e*, epiplastron; *hp*, hyoplastron; *hpp*, hypoplastron; *xp*, xiphiplastron.

GEOLOGY OF THE GLASS MOUNTAINS OF WESTERN OKLAHOMA.

BY MARK WHITE, SOUTHWEST KANSAS COLLEGE, WINFIELD.

Read before the Academy, at McPherson, December 28, 1899.

During the summer of 1899, the author, in company with his brother, Mr. Paul J. White, made a hasty trip to the Glass mountains. During this trip the material for this paper was collected. The author does not claim for this paper a high grade of science work, but a mere sketch of the Glass mountains, and of the geological formation found there.

From the northeast, as first viewed by us, the Glass mountains may be seen for about thirty miles. They are situated in the southwest to central south part of Woods county, Oklahoma, and cover a territory extending south from the Cimarron river for a distance of six or eight miles and in width four or five miles.

Strictly speaking, the Glass mountains are hardly worthy of the name of mountains, as evidently they are but what is left by erosion of a portion of the Upper Cretaceous. The first peak to which we came from the east, and which is called by the cattlemen "The North Peak," is about ten miles southwest of Cleo, Woods county, Oklahoma. We crossed the Cimarron river by fording at Cleo. The stretch of country from this place to the mountains is a level alkali plain, with but little vegetation except mesquit and sage-brush. The plain reaches to the very foot of the mound, which is about 200 feet in altitude and almost circular. To the south of this mountain is one covering much more space, but it is